HIGH PERMITTIVITY GATE DIELECTRIC

ABSTRACT OF THE INVENTION

A field effect semiconductor device comprising a high permittivity silicate gate dielectric and a method of forming the same are disclosed herein. The device comprises a silicon substrate **20** having a semiconducting channel region **24** formed therein. A metal silicate gate dielectric layer **36** is formed over this substrate, followed by a conductive gate **38**. Silicate layer **36** may be, e.g., hafnium silicate, such that the dielectric constant of the gate dielectric is significantly higher than the dielectric constant of silicon dioxide. However, the silicate gate dielectric may also be designed to have the advantages of silicon dioxide, e.g. high breakdown, low interface state density, and high stability. The present invention includes methods for depositing both amorphous and polycrystalline silicate layers, as well as graded composition silicate layers.